IN THE CLAIMS

The following listing of the claims is provided in accordance with 37 C.F.R. §1.121:

1. (original) A method of jointly optimizing the performance of a probe and imager combination, comprising the steps of:

simulating images of a phantom which would be produced by said probe and imager combination in accordance with a statistical design of experiment, a probe geometry specification, and a set of imager parameters, said statistical design of experiment allowing a subset of said imager parameters to vary; and

quantifying the diagnostic value of each image simulated based at least in part on an image quality specification to produce simulation-based image quality data.

2. (original) The method as recited in claim 1, wherein said probe geometry specification comprises a specification of layers in said probe, and said simulating step comprises the step of computing an impulse response based at least in part on said specification of layers in said probe.

3. (original) The method as recited in claim 2, wherein said set of imager parameters comprises a definition of aperture geometry, and said simulating step further comprises computing acoustic diffraction based at least in part on said impulse response, said definition of aperture geometry and said phantom.

4. (original) The method as recited in claim 1, wherein at least some of said imager parameters are retrieved from a database containing respective sets of imager parameters for pre-existing probes.

5. (original) The method as recited in claim 2, wherein said step of computing an impulse response employs a one-dimensional acoustic stack design.

6. (original) The method as recited in claim 1, further comprising the step of generating transfer functions based at least in part on said simulation-based image quality data.

7. (original) The method as recited in claim 6, wherein said image quality specification is a function of at least one image quality parameter, and at least one of said transfer functions relates said image quality parameter to said subset of imager parameters.

8. (original) The method as recited in claim 7, further comprising the step of deriving a statistical distribution of said image quality parameter as a function of at least one imager parameter of said subset using at least one of said transfer functions.

9. (original) The method as recited in claim 6, wherein said image quality specification specifies a value representing an overall image quality, and at least one of said transfer functions relates said overall image quality value to said subset of imager parameters.

10. (original) The method as recited in claim 1, wherein said image quality specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to said image quality parameter.

11. (original) The method as recited in claim 6, further comprising the step of optimizing imager parameters of said probe and imager combination based at least in part on said transfer functions.

12. (original) The method as recited in claim 6, further comprising the step of optimizing said specification of layers in said probe based at least in part on said transfer functions.

13. (original) The method as recited in claim 6, further comprising the step of generating a graph representing image quality as a function of cost based at least in part on said transfer functions.

14. (original) A computer system comprising a display monitor, an operator interface, and programming for performing the following steps:

simulating images of a phantom which would be produced by a probe and imager combination in accordance with a statistical design of experiment selected via said operator interface, a probe geometry specification comprising at least a portion specified via said operator interface, and a set of imager parameters comprising at least one imager parameter set via said operator interface, said statistical design of experiment allowing a subset of said imager parameters to vary;

controlling said display monitor to display said simulated images; and

quantifying the diagnostic value of each image simulated based at least in part on an image quality specification to produce simulation-based image quality data.

15. (original) The computer system as recited in claim 14, wherein said image quality specification comprises at least a portion selected via said operator interface.

16. (original) The computer system as recited in claim 14, wherein said operator interface comprises a graphical user interface for selecting said statistical design of experiment.

17. (original) The computer system as recited in claim 14, wherein said operator interface comprises a graphical user interface for setting said at least one imager parameter.

18. (original) The computer system as recited in claim 14, wherein said operator interface comprises a graphical user interface for specifying at least said portion of said probe geometry specification.

19. (original) The computer system as recited in claim 14, wherein said probe geometry specification comprises a specification of layers in said probe, and said simulating step comprises the step of computing an impulse response based at least in part on said specification of layers in said probe.

20. (original) The computer system as recited in claim 19, wherein said set of imager parameters comprises a definition of aperture geometry, and said simulating step further comprises computing acoustic diffraction based at least in part on said impulse response, said definition of aperture geometry and said phantom.

21. (original) The computer system as recited in claim 14, further comprising a database containing respective sets of imager parameters for pre-existing probes, wherein at least some of said imager parameters are retrieved from said database.

22. (original) The computer system as recited in claim 19, wherein said step of computing an impulse response employs a one-dimensional acoustic stack design.

23. (original) The computer system as recited in claim 14, further comprising programming for generating transfer functions based at least in part on said simulation-based image quality data.

24. (original) The computer system as recited in claim 23, wherein said image quality specification is a function of at least one image quality parameter, and at least one of said transfer functions relates said image quality parameter to said subset of imager parameters.

25. (original) The computer system as recited in claim 24, further comprising programming for deriving a statistical distribution of said image quality parameter as a function of at least one imager parameter of said subset using at least one of said transfer functions.

26. (original) The computer system as recited in claim 23, wherein said image quality specification specifies a value representing an overall image quality, and at least one of said transfer functions relates said overall image quality value to said subset of imager parameters.

27. (original) The computer system as recited in claim 14 wherein said image quality specification is a function of at least the following: an image quality parameter and a range-dependent weighting coefficient corresponding to said image quality parameter.

28. (original) The computer system as recited in claim 23, further comprising programming for optimizing imager parameters of said probe and imager combination based at least in part on said transfer functions.

29. (original) The computer system as recited in claim 23, further comprising programming for optimizing said specification of layers in said probe based at least in part on said transfer functions.

30. (original) The computer system as recited in claim 23, further comprising programming for controlling said display monitor to display a graph representing image quality as a function of cost based at least in part on said transfer functions.

31. (original) A computer system comprising:

a display monitor;

an operator interface;

means for simulating images of a phantom which would be produced by a probe and imager combination in accordance with a statistical design of experiment selected via said operator interface, a probe geometry specification comprising at least a portion specified via said operator interface, and a set of imager parameters comprising at least one imager parameter set via said operator interface, said statistical design of experiment allowing a subset of said imager parameters to vary;

means for controlling said display monitor to display said simulated images; and

means for quantifying the diagnostic value of each image simulated based at least in part on an image quality specification to produce simulation-based image quality data.

32. (original) A computer system comprising first and second computers connected via a network, wherein said first computer is programmed with transducer design advisor software for generating a series of graphical user interface windows, creating files which define a design of experiment analysis based at least in part on inputs to said windows, and uploading said files to said second computer, and said second computer is programmed with simulation software for simulating images of a phantom in accordance with a design of experiment defined by said uploaded files.

33. (original) The computer system as recited in claim 32, wherein said second computer is further programmed with file server software which handles transactions between said transducer design advisor software and said simulation software.

34. (original) The computer system as recited in claim 32, wherein first computer is further programmed with spreadsheet software having a design of experiment toolset for creating a design of experiment matrix, and said second computer is further programmed with analysis server software which provides communications links between said simulation software and said spreadsheet software.

35. (original) The computer system as recited in claim 32, wherein said simulation software comprises acoustic stack simulation software, ultrasound beam simulation software, and design of experiment software for performing simulations in a design of experiment mode.

36. (original) The computer system as recited in claim 32, wherein said second computer is further programmed with scoring software which calculates an image quality value using weighting coefficients received from said first computer.

37. (original) The computer system as recited in claim 34, wherein said second computer is further programmed with scoring software which calculates an image quality value using weighting coefficients received from said first computer, and said design of experiment toolset comprises a regression tool for generating transfer functions based at least in part on said scoring.

38. (original) A method of setting up a simulation in a design of experiment mode, comprising the steps of:

specifying a probe geometry characteristic by interacting with a first graphical user interface window;

specifying an imager parameter by interacting with a second graphical user interface window;

specifying a weighting coefficient for an image quality parameter by interacting with a third user interface window; and

creating computer files comprising specifications specified during said specifying steps in response to an input to a fourth user interface window.

39. (original) A graphical user interface comprising a sequence of windows which allow a user to set up a simulation in a design of experiment mode, said sequence comprising:

a first window for enabling a user to specify a probe geometry characteristic;

a second window for enabling a user to specify an imager parameter;

a third window for enabling said user to specify a weighting coefficient corresponding to an image quality parameter; and

a fourth window for activating creation of computer files comprising specifications specified using said first through third windows.